YOUR BRAIN ON FOOD: NUTRITION FOR THE MIND

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Disclosures

• None. Just the positions listed in the above slide.

• I am a fan of the brain.
<table>
<thead>
<tr>
<th>Learning Objectives</th>
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<tbody>
<tr>
<td><strong>Identify</strong></td>
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<td>Identify key foods to include and avoid to support optimal brain health.</td>
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<tr>
<td><strong>Interpret</strong></td>
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<td>Interpret pertinent blood labs which may help to assess risk of neuro-degeneration</td>
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<td><strong>Discuss</strong></td>
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<td>Discuss the potential impact of micronutrient deficiencies on mood, cognition and memory</td>
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<td><strong>Implement</strong></td>
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<td>Implement dietary and lifestyle strategies to help patients support mental health and reduce the risk for cognitive decline.</td>
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THE BRAIN:

WE’VE ALL GOT ONE AND WE’D ALL LIKE TO KEEP IT FUNCTIONING OPTIMALLY
Alzheimer’s & Mental Health Issues...Not going away any time soon.

- Alzheimer’s Disease
  - Accounts for an estimated 60 to 80 percent of dementia cases in the elderly populations
  - The worldwide prevalence of dementia is now estimated to exceed 36 million cases with a further projection of 115 million by 2050

- Aging of the brain throughout our lives is natural
  - Your brain actually gets smaller
  - Hippocampus (responsible for memory) gets smaller as do the areas where our executive function and decision making processes happen

- Neurodegeneration and vascular pathologies are the causes of dementia
Alzheimer’s & Mental Health Issues…Not going away any time soon.

Depression

• In 2015, an estimated 16.1 million adults aged 18 or older in the United States had at least one major depressive episode in the past year. This number represented 6.7% of all U.S. adults


• 15% of women & 10% of men >65 experience depressive symptoms

  • https://agingstats.gov/docs/LatestReport/Older-Americans-2016-Key-Indicators-of-WellBeing.pdf
Is it time for a shift in the approach to mental/cognitive health care?

• Integrative approaches that consider the whole person and the many available strategies may help provide a more comprehensive and strategic intervention.

• Goal = to prevent avoid the break down of physiological systems/issues before they start happening. This includes brain health.

• No one right strategy for everyone. It’s about experimentation
  • N = 1
  • We need to look at the individual in front of us.
Clear Connections in the Research

- Poor dietary patterns associated with higher incidence of depression/anxiety in children/adolescents mental health
- Cognitive Decline is correlated with diet
Common Lifestyle-related Chronic Conditions

- Obesity
- Heart disease
- High blood pressure
- Diabetes
- High cholesterol
- Inflammation

ALL ARE ASSOCIATED WITH COGNITIVE DECLINE, DEMENTIA AND MOOD

Diabetes has been linked to Mental Health - Anxiety - Depression - Mood Swings - **Mindful Eating Help:** Research supports increased awareness around eating and dietary patterns can improve blood sugar, reduce anxiety and depression and aid in weight loss.

Diabetes & Cognition

• Both obesity and Type 2 diabetes/Metabolic Syndrome are associated with cognitive decline.
  • Due to Insulin resistance, which is a strong risk factor for both diabetes and dementia.

  • Insulin resistance impacts the ability of key areas of the brain to use sugar. - may impair memory and cognitive ability

• Alzheimer’s as “Type 3 diabetes” because of the insulin resistance connection

• Even short term high levels of insulin can affect memory

“I occasionally need to read my tweets to remember what I was doing.”
Blood pressure & Brain function


Inflammation = link

- Linked to both Alzheimer’s and non-Alzheimer’s dementia risk.

- **Damages vessels in the brain** in exactly the same way it damages peripheral vessels and causes heart disease.

- High levels of inflammatory markers like **CRP are related to the amyloid plaques and neurofibrillary tangles** that are hallmarks of AD.

Inflammation = link

• Can cause memory problems **at any age** by specifically impacting neurons in the area of the brain responsible for memory (the hippocampus).

• May **alters** levels of neurotransmitters like serotonin and melatonin, which can relate to depression and anxiety.


BUT NO NEED TO BE DEPRESSED...
There is hope with diet and lifestyle modifications

How the foods you eat affect how you feel

Serotonin is a neurotransmitter that helps regulate sleep and appetite, mediate moods, and inhibit pain. Since about 95% of your serotonin is produced in your gastrointestinal tract, and your gastrointestinal tract is lined with a hundred million nerve cells, or neurons, it makes sense that the inner workings of your digestive system don’t just help you digest food, but also guide your emotions. What’s more, the function of these neurons — and the production of neurotransmitters like serotonin — is highly influenced by the billions of “good” bacteria that make up your intestinal microbiome. These bacteria play an essential role in your health. They protect the lining of your intestines and ensure they provide a strong barrier against toxins and “bad” bacteria; they limit inflammation; they improve how well you absorb nutrients from your food; and they activate neural pathways that travel

Why nutrition is the key to Alzheimer’s

The multi-factorial lifestyle and nutrition based approach that may be the answer to dementia.

Alzheimer's disease is incurable but preventable
The significant value of Integrative RDN’s

- **The brain relies on adequate nutrients to function**
  - Carbs, Protein, Fat, Vitamins and minerals
  - Dietitians can help provide building blocks for optimal brain health.
  - Excesses & deficiencies

- **Common chronic health issues that we often see** are correlated with less optimal brain function/health

- **Many of our patients struggle with depression. When people are depressed or struggling with mental health issues**, they make less healthy decisions around their diet and lifestyle

- **Many** patients may express concern about their concern around developing cognitive impairment
The significant value of Integrative RDN’s

• **Assess Medications** may impact their nutritional status

• **Offer potential guidance for supplements** could have a beneficial impact or may be having effects that may be working against them.
  • Direct them to quality products

• **Discuss Exercise, Address Sleep, Stress and GI Function:**

  • **Explore Environment:** toxic exposure etc.
  • **Social connections/sense of purpose**
  • **Socioeconomic background**
Many Studies support benefits of specific diets

- **Benefits of the Mediterranean Diet** which has been shown to help reduce the risk of neurodegenerative disease, increase brain volume and preserve “white matter microstructure”.

- **Higher adherence to the Mediterranean Diet** is associated with lower mortality in Alzheimer’s Disease”

- *Meta analysis concluded:* “**Adherence to a Mediterranean diet may contribute** to the prevention of a series of brain diseases;

**The Mind Diet Slows Cognitive Decline**


START THINKING CRITICALLY.
PUT ON YOUR DETECTIVE HAT FOR A
COMMON ISSUE
A BRAIN-SUPPORTIVE DIET: BOTH MACRONUTRIENT AND MICRONUTRIENT BASED
Carbohydrates: provide

- **Fuel for the brain – blood sugar balance**

- **Many vitamins that play a role in brain function**
  - Eg: Grains and other complex carbs contain
    - B vitamins for optimal levels of Homocysteine – associated with depression and cognitive decline
    - B Vitamins for production of energy

- **Prebiotics for our microbiome which can have an impact on brain function**

- **Negative:** Refined carbohydrates in excess may lead to dysglycemia, insulin resistance and dyslipidemia which can negatively affect brain function
  - Aging 2014;6(9):707-717
  
  - Imbalanced blood sugars can affect mood
Research on the impact of refined carbs

“A dietary pattern with relatively high caloric intake from carbohydrates and low caloric intake from fat and proteins may increase the risk of Mild Cognitive Impairment or dementia in elderly persons.”


• “Even in the subclinical range and in the absence of diabetes, monitoring and management of plasma glucose levels could have an impact on cerebral health.”


What is being served in LT Health Care facilities?
Data suggest that greater glycemic variability may be associated with lower quality of life and negative moods.
CARBS

• AVOID/MINIMIZE
  • Sweets
  • Refined flour (including GF)
  • Excessive alcohol (5 oz = portion)
  • Sweetened beverages

• ENCOURAGE
  • Whole grains
  • Starchy vegetables
  • Beans/legumes/pulses
  • Bright colored fruit (more on this to come...
Fats: Provide

• Essential Fatty Acids:

  • Omega 3’s and Omega 6’s play an important role in brain health
    • Anti-inflammatory
    • Protective to the heart

  • Low Omega 3’s specifically linked to cognitive decline, depression and mood disorders

Fats: Provide

• Mono-unsaturated fats are heart healthy (healthy heart = health brain)

• Feeling of satiety and can also be blood sugar balancing

• Help absorb fat soluble vitamins: like A,D,E,K – role in mood and brain health

• **Negative:** Excess saturated and Trans fats have an adverse impact on brain - “relationships between saturated and trans fat intake and risk of cognitive disorder”

  
  
  
  
FATS

• AVOID/MINIMIZE

• Trans fats
• Excessive saturated fats
• Excessive amounts of processed refined oils
  • (high linoleic acid as precursor to arachidonic acid. More to come on this.)

• ENCOURAGE

• Omega 3 sources: fatty fish, flax, hemp, chia, walnuts. Soybeans,
  • Grass fed and free range meats and eggs
• Unrefined Omega 6 sources
  • Sunflower seeds, hemp.
• Monounsaturated: avocado, olive oil, almonds
Proteins: provide

• Building blocks for neurotransmitters:
  • Excitatory or inhibitory: Dopamine, Serotonin, GABA,
  • Impact on mood as well as cognition/memory
  • Choline: Acetylcholine
  • Tryptophan: Serotonin
A neurotransmitter important in memory storage (2)

### Food Sources - Acetylcholine

<table>
<thead>
<tr>
<th>Food</th>
<th>Cals</th>
<th>DRI/DV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shrimp</td>
<td>135</td>
<td>36%</td>
</tr>
<tr>
<td>Eggs</td>
<td>78</td>
<td>35%</td>
</tr>
<tr>
<td>Scallops</td>
<td>126</td>
<td>30%</td>
</tr>
<tr>
<td>Chicken</td>
<td>187</td>
<td>23%</td>
</tr>
<tr>
<td>Turkey</td>
<td>167</td>
<td>22%</td>
</tr>
<tr>
<td>Tuna</td>
<td>147</td>
<td>21%</td>
</tr>
<tr>
<td>Cod</td>
<td>96</td>
<td>21%</td>
</tr>
<tr>
<td>Salmon</td>
<td>158</td>
<td>19%</td>
</tr>
<tr>
<td>Beef</td>
<td>175</td>
<td>17%</td>
</tr>
<tr>
<td>Collard Greens</td>
<td>63</td>
<td>17%</td>
</tr>
</tbody>
</table>
Proteins: provide

• Compounds (amino acids) necessary for our body’s detoxification and antioxidant defense system: glycine, cysteine, glutamine

• Helpful for balancing blood sugar which can be helpful for mood and cognitive function
Importance of Micronutrients for brain

• **Energy metabolism** of neurons and glial cells
  • **Gliai Cell:** surround and support neurons

• **Cofactors** for Neurotransmitter synthesis and Nerve impulse propagation

• **Homocysteine metabolism.**

• [http://lpi.oregonstate.edu/mic/health-disease/cognitive-function#brain-needs](http://lpi.oregonstate.edu/mic/health-disease/cognitive-function#brain-needs)
Homocysteine: sulfur containing amino acid

- Elevated levels are linked to
  - Depression & Neurotoxicity
  - Cardiovascular disease
  - Cognitive Decline

- Lower homocysteine linked to slower brain volume loss in older adults

Homocysteine Metabolism

- Methionine → S-adenosyl methionine (SAM) → S-adenosyl homocysteine (SAH) → Homocysteine

- Folate is acting as a methyl donor here.

- Serine
- Glycine
- 5,10-methylene-tetrahydrofolate reductase
- 5-methyl-tetrahydrofolate
- Methionine synthase (vitamin B12)
- Tetrahydrofolate

- Cystathionine β-synthase (CBS) (vitamin B6) (defective in homocystinuria)

- B Complex
Vitamins and Minerals to highlight in diet

• B vitamins: Folate, B6:
  • Homocysteine Cycle
  • Required as co-factors for glucose oxidation in the brain
  • **RDN Action:** EAT: dark leafy greens, whole grains, beans

• Vitamin D:
  • Low levels (<30) are associated with poorer mood & cognitive decline
  • **RDN Action:** Test for levels. Encourage salmon, eggs, mushrooms, time in sun

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Vitamins and Minerals to highlight in diet

• Vitamin E
  • Neuroprotective
  • **RDN Action**: Ensure sources of nuts and seeds, avocado and fat with diet.

• Magnesium co-factor
  • Important for glucose metabolism
  • Shown in some studies to help with anxiety
  • **RDN Action**: Encourage Dark Leafy Greens, pulses, nuts and seeds. Experiment with Supplementation: 200-400mgs Mg Glycinate

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Vitamins and Minerals

• Zinc: A co-factor
  • Important for proper function of GABA, and norepinephrine
  • **RDN Action:** Ensure sources: animal meat, oysters, pumpkin and sunflower seeds. Test for zinc status if possible or assess for zinc deficiency.

• Iron: A co-factor
  • Assist in development of oligodendrocytes (the brain cells that produce myelin)
  • Maternal iron deficiency results in decreased iron concentrations in the brain and permanent changes in cognitive performance and behavior in the offspring
  • **RDN Action:** Ensure sources: dark meats, beans, lentils, tempeh, dried fruit, Assess labs, consider supplementation

VITAMINS & MINERALS
MATTER
Methylmalonic Acid & B12 Status
STUDIES: B₁₂ Status & Methylmalonic Acid

Elevated Methylmalonic Acid (MMA): B₁₂ status Indicator

- Associated with lower cognitive scores, especially language comprehension and expression
  - Neurology 2011;77(13):1276-82

- “Subclinical” B₁₂ deficiency may have significant negative impact on memory, balance and mood
  - Nutrients 2013;5(12):5031-5045

- **RDN Action**: Test for MMA if possible as well as B₁₂ levels. Ensure adequate food sources. 
  Assess GI function or medication interactions
Do we need supplements? Study in 2010:

- Randomized, double-blind, placebo-controlled trial:
  - N = 215 men, aged 35 to 55 years,

- Supplemental B vitamins (at 3 to 13 times the current RDA, except for folic acid which was included at a dose equivalent to the RDA),
- vitamin C (500 mg/day), minerals, zinc (10 mg/day), calcium (100 mg/day), and magnesium (100 mg/day) on mood and perceived stress.

- Took supplement for 33 days had significantly improved ratings on
  - Profile of Mood States (POMS) scale,
  - Significantly reduced subjective stress as measured by the Perceived Stress Scale,
  - Significantly improved self-ratings of mental tiredness prior to and following a battery of cognitively demanding tasks

Possibly helpful Supplements?: B Vitamins may need to be “methylated” (Eg: “Methylcobalamin”) 
(Studies are conflicting. Individualize treatment)


Kaplan BJ, A randomised trial of nutrient supplements to minimise psychological stress after a natural disaster. Psychiatry Res [Internet]. 2015;228(3):373–9
Genetics? Highlight on: MTHFR

- **MTHFR 677 GENE VARIANT:** (Methyltetrahydrofolate reductase)

- If homozygous or heterozygous

- Associated with higher levels of depression

- Increases risk for elevated homocysteine

- **RDN ACTION:** Ensure sufficient B Vitamins; stress mgmt.,

To supplement or not to supplement!

- Recent evidence came out about the potential link between Vitamin B supplementation and increased risk of cancer

- Some studies show benefit while others show none for people taking B vitamins for their depression.

- It may be a matter of weighing the pros and the cons or considering a trial to see if there is any benefit.
Phytochemicals: Plant chemicals

- **Anti-inflammatory** –
  - Inflammation implicated in brain decline

- Shown to be neuroprotective.

- **Help with oxidative stress:** implicated in neurodegeneration, and aging

- **Oxidative stress** is essentially an imbalance between the production of free radicals and the ability of the body to counteract or detoxify their harmful effects through neutralization by antioxidants

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### Colorful Fruits, Vegetables, and Phytochemicals

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<tr>
<th>Color</th>
<th>Phytochemicals</th>
<th>Fruits and Vegetables</th>
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<tbody>
<tr>
<td>White and green</td>
<td>Ally sulphides</td>
<td>Onions, garlic, chives, leeks</td>
</tr>
<tr>
<td>Green</td>
<td>Sulforaphanes, indoles</td>
<td>Broccoli, Brussels sprouts, cabbage, cauliflower</td>
</tr>
<tr>
<td>Yellow and green</td>
<td>Lutein, zeaxanthin</td>
<td>Asparagus, collard greens, spinach, winter squash</td>
</tr>
<tr>
<td>Orange and yellow</td>
<td>Cryptoxanthin, flavonoids</td>
<td>Cantaloupe, nectarines, oranges, papaya, peaches</td>
</tr>
<tr>
<td>Orange</td>
<td>Alpha and beta carotenes</td>
<td>Carrots, mango, pumpkin</td>
</tr>
<tr>
<td>Red and purple</td>
<td>Anthocyanins, polyphenols</td>
<td>Berries, grapes, plums</td>
</tr>
<tr>
<td>Red</td>
<td>Lycopene</td>
<td>Tomatoes, pink grapefruit, watermelon</td>
</tr>
</tbody>
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**Alzheimers Dement.** 2015 Sep; 11(9): 1007–1014.


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**RDN ACTION:**

**ENCOURAGE BRIGHT COLORED FOODS!**

**BERRIES & GREENS!**

*(THIS INCLUDES HERBS AND SPICES)*
Spotlight on Curcumin

• Strong antioxidant action- inhibit formation of free radicals

• May help the macrophages to clear the amyloid plaques found in Alzheimer's disease.

• Has anti-proliferative actions on microglia which surround the plaques in AD patients

• Reduces inflammation:
  • The exposure to curcumin also impaired the production of pro-inflammatory cytokines (IL-1, IL-6 and TNF-a.

A growing body of evidence indicates that oxidative stress, free radicals, beta amyloid, cerebral deregulation caused by bio-metal toxicity and abnormal inflammatory reactions contribute to the key event in Alzheimer's disease pathology. Due to various effects of curcumin, such as decreased Beta-amyloid plaques, delayed degradation of neurons, metal-chelation, anti-inflammatory, antioxidant and decreased microglia formation, the overall memory in patients with AD has improved."
**RESEARCH ARTICLES ON CURCUMIN**

- Cox, K et al. Investigation of the effects of solid lipid curcumin on cognition and mood in a healthy older population; *Journal of Psychopharmacology* 2015, Vol. 29(5) 642–651
  - N = 60 healthy adults aged 60–85.
  - 400 mg as Longvida for 4 weeks
  - Improved performance on sustained attention and working memory tasks,

- DiSilvestro RA1; Diverse effects of a low dose supplement of lipidated curcumin in healthy middle aged people. *Nutr J.* 2012 Sep 26;11:79.
  - N = 19 Healthy middle aged people
  - (80 mg/day) in a lipidated form 4 weeks
  - Lowering of plasma beta amyloid protein concentration & Tg’s
**RESEARCH ARTICLES: Meta-Analysis**

- “Results...support the significant clinical efficacy of curcumin in ameliorating depressive symptoms.

**NOTE:**

- “No adverse events were reported in any of the trials.”
Options

[Image of Curcumin 95 supplement]

[Image of Theracurmin supplement]

Turmeric Concentrate
Curcumin 95
Antioxidant Support
500 milligrams
120 capsules
Dietary Supplement

#1 ABSORBED FORM OF CURCUMIN
30 Vegetarian Capsules
HEALTHY INFLAMMATORY RESPONSE

natural Factors
Ideas for cooking with Turmeric

• Include Fat & Pepper (piperine)

• Grate into a marinade
• Throw in a stir fry
• Add to a smoothie
• Use in Cole slaw
• Add to a pureed soup
• Make “Golden Milk”: turmeric powder, almond/coconut milk and honey/stevia
Some NON-Food Considerations that still have to do with food

**AGE’s:** Advanced Glycation End Products produced from charred meat associated with memory decline
- **RDN Action:** Marinate with herbs (rosemary)
  - Marinate with lemon


**BPA – Bis phenyl A**
- Protective coating in canned foods & in food storage containers/bottles & plastics
- **RDN Action:** Encourage glass, metal containers
BPA: Bis-phenyl A

- **Newest FDA update:** “some concern about the potential effects of BPA on the brain, behavior, and prostate gland in fetuses, infants, and young children”

- Associated with higher levels of hyperactivity and aggression in 2-year old children, particularly amongst girls.

- BPA exposure has been shown to increase anxiety related behavior in both rats and mice

- **Why not reduce exposure where possible?**

Some NON-Food Considerations that still have to do with food

• **Pesticides**
  
  • Carcinogenic
  
  • **RDN Action:** Encourage organic or local/pesticide free as often as possible
  
  • [www.EWG.org](http://www.EWG.org) – The Dirty Dozen


• **Mercury in seafood**
  
  • **RDN Action:** Choose low mercury fish: salmon, sardines, Anchovies, Trout
  
  • Avoid high Mercury Fish: Tuna, Swordfish, seabass, yellowtail
  
  • [https://www.nrdc.org/stories/mercury-guide](https://www.nrdc.org/stories/mercury-guide)

WHAT’S “LABS” GOT TO DO WITH IT?
Some possible LABS to Look at & Monitor for nutrient status

- **Homocysteine**: ≤ 15
- **Methylmalonic Acid** (measure of B12 status) ≤ 379
- **Vitamin D**: > 30 (differing opinions on what is optimal)
- **Mercury**: < 6
- **Ferritin**: 15-150 (Check for low AND high – Acute phase reactant aka inflammation)
- **Fatty Acid Profile**: Omega 3’s: EPA/DHA’s
- **EPA/AA ratio** (Arachidonic Acid) > .18

*These ranges are from LABCORPS*
Research: Low EPA/AA ratio

- Associated with White matter lesions in brain and **cognitive impairment** resulting from cerebrovascular disease.

- Increased likelihood of major depressive disorder with anxiety.

- An independent risk marker for coronary artery disease and unstable atherosclerotic plaques.
RDN ACTION: Improving Your Ratios

Eat More:
- Fish
- Flax
- Walnuts
- Chia
- Hemp
- EPA Supplements

Eat Less:
- Chicken
- Beef
- Eggs
- Pork
- Dairy
- Excessive amounts of refined oils high in Om 6 – Linoleic acid
  - Corn, soybean, sunflower oil
Additional possible LABS reflecting health status/metabolic status to look at & monitor

- CRP: C – Reactive Protein < 1
- Fasting Glucose <100
- Insulin < 12
- HOMA-IR = validated calculation indicating possible insulin resistance < 2.7
- HbAIC < 5.6
- Cholesterol Levels including particle number (<1000)
- Blood Pressure

- *Highest CRP’s: longer to complete tasks related to executive functioning Neurology 2010;74(13):1022-1029*
- *MRI: highest CRP’s brain changes equivalentto 12 years of aging J Neuroinflammation Mar 2011;8:26*
Possibly beneficial Supplements: Omega 3 Fatty Acids

Dosage: 1000mgs-2000mgs depending on individual

Vitamin D Supplementation

Dosage: 1000mgs-2000mgs depending on blood levels and re-test
WHAT DO WE DO?
Anti-Inflammatory/Mediterranean diet
Focus on dietary strategies to improve cardiovascular health & balanced blood sugar

- Ensure sufficient Omega 3’s & fiber/complex carbs
- Ensure sufficient Mineral intake
- Ensure anti-inflammatory compounds
- Ensure sufficient Fluids
- Minimize alcohol, caffeine, sugar (fructose harmful for BP), poor quality fats
- Balanced meals and consistent meal timing
- Focus on more plant based foods
As integrative RDN’s, we cannot talk about brain health and food only without including other lifestyle factors.
It's all Connected.

This Is Integrative Medicine at play.
Microbiome: Emerging research around gut and brain health

• Studies in germ-free animals and in animals exposed to pathogenic bacterial infections, probiotic bacteria or antibiotic drugs suggest a **role for the gut microbiota in the regulation of anxiety, mood, cognition and pain.**

• **RDN Action:** Keep the gut healthy with fiber, fermented foods, probiotics

Microbiota Transfer Therapy alters gut ecosystem and improves gastrointestinal and autism symptoms: an open-label study

Dae-Wook Kang†, James B. Adams†, Ann C. Gregory†, Thomas Borody, Lauren Chittick, Alessio Fasano, Alexander Khoruts, Elizabeth Geis, Juan Maldonado, Sharon McDonough-Means, Elena L. Pollard, Simon Roux, Michael J. Sadowsky, Karen Schwarzberg Lipson, Matthew B. Sullivan †, J. Gregory Caporaso † and Rosa Krajmalnik-Brown †

**N = 18 ASD-diagnosed children.**

**Fecal transplant post 2 week anti-biotic treatment**

**CONCLUSION:** **80% reduction of GI symptoms at the end of treatment,** including significant improvements in symptoms of constipation, diarrhea, indigestion, and abdominal pain. Improvements persisted 8 weeks after treatment. Similarly, clinical assessments showed that **behavioral ASD symptoms improved significantly** and remained improved 8 weeks after treatment ended.
Exercise/Physical Activity: Protective to brain

• Builds new neural connections
• Enhances cognition
• May protect against dementia
• Reduce shrinkage of the hippocampus, a key brain structure for memory, in older adults with genetic risk for Alzheimer’s.
• **Stimulates BDNF** - (brain-derived neurotrophic factor)
  • enhances growth of new neurons and neuronal plasticity.

http://www.health.harvard.edu/blog/regular-exercise-changes-brain-improve-memory-thinking-skills-201404097110
Exercise/Physical Activity:

- Increases dopamine
- Improves mood – adaptive response
- Aerobic is most beneficial

**RDN Action:** get people moving.
Aim for 30-60 min per session, 4-6 days per week.
Medications

- **Anticholinergic drugs**
  
  

- **Proton Pump inhibitors**
  
  
Sleep (or lack there of)

• Helpful both for prevention of cognitive decline as well as enhancing current cognition, memory and focus.

• Glymphatic system: brain cleaning
  
  • A waste clearance system in the central nervous system.
  • **Helps with elimination of** Accumulated toxins, including beta-amyloid and tau,
    • Increased beta-amyloid and tau are associated with Alzheimer’s disease


Lulu Xie, *Sleep Drives Metabolite Clearance from the Adult Brain* *Science* 18 Oct 2013: Vol. 342, Issue 6156, pp. 373-377 DOI: 10.1126/science.1241224
Sleep (or lack there of)

• **Sleep Apnea**: poor oxygenation of the brain may worsen cognitive function

• Mood is also affected by poor sleeps

• 7-9 hours are critical for brain health

• **RDN Action**: Work with patients on Sleep hygiene or at least Identify poor sleeping patterns and refer out
  - Consider Melatonin & magnesium before bed

http://www.aasmnet.org/resources/pdf/pressroom/Adult-sleep-duration-methods.pdf
Social Support and Stimulation

• People with strong social connections have lower risk of cognitive problems even when they have other risk factors for dementia.

• Occupational complexity

• Learning new skill, language, musical instrument

• Memory games and strategies

• Volunteering and helping others can help improve mood

• **RDN Action:** explore ways to promote the above
Stress

- High levels of **cortisol damage** neurons in the hippocampus,

- Hippocampus damage can also lead to depression and increase risk for dementia.

- Chronic stress reduces ability of neurons to survive neurological disease.

- Impairs cognitive performance

- Impacts our ability to regulate emotion

- **RDN Action:** Encourage stress management, meditation, contemplation
  - [www.calm.com](http://www.calm.com)
  - [www.headspace.com](http://www.headspace.com)
  - Listen to music, be in nature, dance, anything that relaxes you

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OTHER THINGS TO LOOK INTO

• 12 -14 hour fasting between dinner and breakfast

• Restricted calories: See CALERIE trial
  • https://calerie.duke.edu/

• Meditation

• Gluten sensitivity
GLUTEN SENSITIVITY/INTOLERANCE

“Results have been published that have proved that gluten intolerance can also affect people... The new syndrome has been named non-celiac gluten sensitivity (NCGS) or gluten sensitivity (GS). It has been included in the new list of gluten-related disorders published in 2012. Researchers believe that NCGS is the most common syndrome of gluten intolerance”


Symptoms such as “abdominal pain, headaches, brain fog, tingling and/or numbness in hands and feet, fatigue and musculoskeletal pain.” Resolve with a GF diet.
Case study for Assessment: Judith (If time)

Social Hx:
54 yo, divorced, 2 teenagers, full time employed; very busy and little time to herself—runs marketing agency.

Goals:
She is concerned about getting Alzheimer’s herself and feels she isn’t being the best mom to her kids because of her mood.
Case study for Assessment Judith

- **5’5, 160lbs (typical weight has been 125#)**

- **Current Med Hx:** Tired all the time; headaches; High cholesterol; some GERD; Has a hx of depression.

- **Family Med Hx:** both grandmothers had Alzheimers. Mom is beginning to lose memory

- **LABS:** Low HDL; elevated CRP, Low Vitamin D

- **Meds:** Statins, daily NSAIDS for headaches and joint pain; Prilosec

- **Exercise:** Fairly sedentary, walks dog when teenagers can’t

- **Sleeps** 6 hours night. Not very restful.

- **Stress & Social Connections:** High stress; very little time to do the things she loves: (used to dance with former husband; reading and documentaries)
Judith: TYPICAL DAY OF MEALS

- **BKFST:** Kashi Go lean cereal with 1% milk. 2 cups coffee with 2 scoops of coffee mate
- **Snack:** orange
- **Lunch:** turkey sandwich with lettuce, tomato, 1 teasp mayo on orowheat bread + bag of lays baked potato chips. Iced tea
- **Snack:** luna bar – nuts over chocolate
- **Dinner:** 1 ½ cups spaghetti with ¾ cup marinara sauce + 1/4 cup low fat parm cheese; Side salad with ½ cup baby carrots and fat free dressing. Glass of milk.
- **Dessert:** 1 skinny cow ice cream
- **Bevs:** 1 cup of water
Judith: A few starting points

1. Increase Omega 3 fatty acids in diet. Supplement likely needed.
2. Increase Antioxidant rich food: add to sandwich and add variety to salad
3. Suggest Vitamin D supplement
4. Increase physical activity
5. Brainstorm sleep strategies
Key Learnings

• Ensure adequate lean/fiber-rich protein, complex carbs and beneficial fats at each meal

• Ensure sufficient fiber (at least 35 grams/day) and be sure to include probiotic rich foods

• Focus on plant based meals with colorful high antioxidant vegetables free from pesticides when possible

• Encourage less sugar, saturated fat; processed meat & refined oils

• Encourage eating less in general: “Hari Hachi bu” = Eat until 80% full) and fasting at least 12 hours overnight

• Ensure daily healthy oils & fats like those from low mercury fish, olives, nuts, seeds and avocado
  • Branch out with nuts & seeds: Pistachios, Hemp, Chia, Flax, Brazil.
Key Learnings to apply with your patients

• Promote adding in more herbs and spices at every meal to promote anti-inflammatory environment

• Ensure more low heat cooking to prevent the production of compounds produced that are harmful to the brain.

• Ensure adequate intake of B vitamins like folate, B6 and B12 – consider supplements short term

• Encourage moving the body more and breaking a sweat

• Promote social connection with others and with nature

• Recommend getting sufficient sleep and practicing stress management techniques including breathing deeply

• Encourage additional blood tests: CRP, Homocysteine, MMA, Vitamin D, Insulin in order to deepen assessment and understanding
Remember:

• Personalize
• Integrate
• Experiment
THANKS!

Questions?
YOUR BRAIN ON FOOD: NUTRITION FOR THE MIND

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